Trend Study 21B-8-03

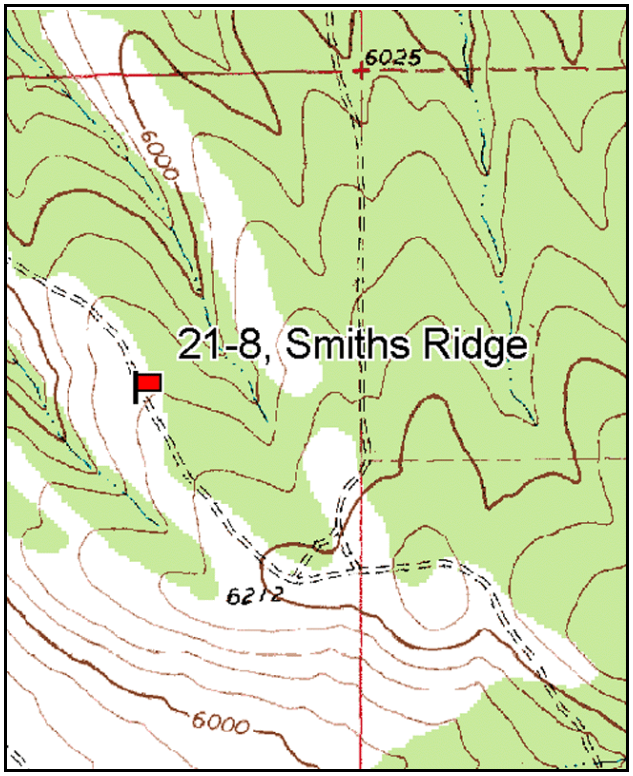
Study site name: Smiths Ridge . Vegetation type: Mtn. Brush Burn .

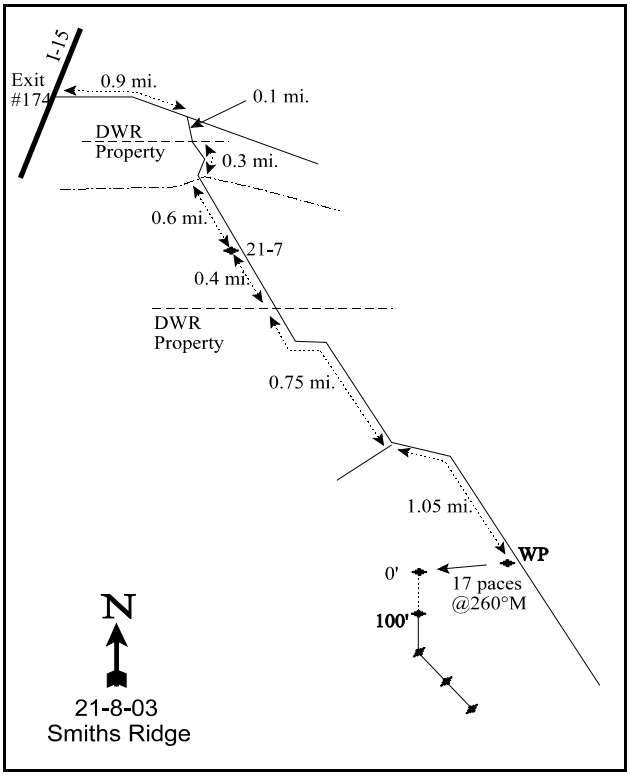
Compass bearing: frequency baseline 170 degrees magnetic.

Frequency belt placement: line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From exit #174 on I-15 south of Holden, proceed to the east side of the freeway, then east on the Maple Canyon Road for 0.9 miles to a cattleguard. Just beyond the cattleguard, turn right and go 0.1 miles to DWR property. Proceed 0.3 miles across a wash and to a 3-way split in the road. Stay left and go 0.6 miles to the Bennett Field transect (21-7). From there, continue 0.4 miles to a gate at the eastern boundary of DWR property. Go another 0.75 miles through 2 more gates to a two track road. Turn left and go 1.05 miles to the witness post. From the witness post walk 17 paces at 260 degrees magnetic. The frequency baseline starts 100 feet due west of the cliffrose. The 0' stake is a 3 foot rebar with a browse tag #7072 attached.





Map Name: Coffee Peak

Diagrammatic Sketch

Township 20S , Range 23W , Section 30

GPS: NAD 27, UTM 12S 4322425 N, 393869 E

DISCUSSION

Smiths Ridge - Trend Study No. 21-8

This study is located on the foothills of the Pahvant Range. The site slopes gently (8-10%) to the west at an elevation of 6,100 feet. This area is part of the extensive chainings completed by the Division in the late 1950's and early 1960's. A large area surrounding the site also burned in August of 2000 as part of the Swain fire. The burned areas were later seeded and chained, although most of the transect itself was not chained. The chaining treatment went around patches of unburned juniper trees that happened to be in the immediate vicinity of the transect. Most of the sampling belts were within the burned area. In the past, herbaceous vegetation was often depleted by heavy early season cattle grazing. AUMs were reduced from 143 in 1977 to 124 in 1984. Livestock use on the site was minimal in both 1998 and 2003, although winter deer use has been moderate in both years. The DWR Upper Smith pellet transect, which is located nearby, showed a fairly consistent trend with an average of 63 deer days use/acre (156 ddu/ha) between 1981 and 1985 (Jense et al. 1985). Between 1986 and 1991, average deer days use/acre decreased to 43 (106 ddu/ha) (Jense et al 1991). Pellet group data taken on the study site in 1998 estimated 70 deer and 28 elk days use/acre (173 ddu/ha and 69 edu/ha). In 2003, deer use was estimated at 90 days use/acre (222 ddu/ha) while elk use was estimated at only 12 days use/acre (30 edu/ha) on the site.

Soil on the site is relatively shallow with an estimated effective rooting depth of only 9 inches. Soils are sandy loam in texture and have a moderately acidic pH (5.7). The soil is very rocky throughout the profile. Prior to the fire, the shrub interspaces contained areas of exposed rock and soil. Following the fire, litter cover decreased, while bare ground increased. Due to the rocky nature of the soil, combined with the high sand content and west aspect, the average soil temperature was relatively high at 74°F in 1998. Dry, hot soils give a competitive advantage to winter annuals like cheatgrass and pale alyssum which start growing earlier in the spring than cool season perennial species. Due to gentle terrain and sandy soils which have high infiltration rates, erosion has been minimal on this site both before and after the fire in 2000. Soils were given a stable rating from an erosion condition class assessment in 2003.

Prior to the burn in 2000, the key browse species included mountain big sagebrush, bitterbrush, and cliffrose. Sagebrush density numbered about 2,000 plants/acre in 1998, with moderate recruitment by the young age class (14%) and low decadence. The cliffrose and bitterbrush were reported to be hybridizing in 1985 which is commonly observed in the Holden area. In 1998, the bitterbrush and cliffrose populations had estimated population densities 600 and 220 plants/acre respectively. Both species displayed normal vigor and moderate to heavy use. The cliffrose population also had a moderate number of young (18%). Prior to the Swain fire, the key species had stable to slightly increasing populations that overall appeared to be healthy and vigorous. Following the burn, the browse component is quite different. Mountain big sagebrush density decreased to 1,440 plants/acre in 2003. The compositional structure of the population is quite different from the pre-burn one. In 2003, young plants made up 61% of the population, decadence was low (8%), and vigor mostly normal. The high number of young sagebrush is mostly due to the fire rehabilitation which included chaining and seeding of the area. Big sagebrush was one of the species that was seeded onto the site. Use on sagebrush remained mostly light to moderate as in previous years. Even with a population decline due to the burn, big sagebrush on the site is healthy and the population should increase with the high recruitment. Bitterbrush and cliffrose were both negatively impacted by the burn. Both species have post-burn densities estimated at 60 plants/acre, while use on both remains moderate to heavy. There were no young plants sampled for either species in 2003, but vigor was normal for both.

Other notable changes in the browse community following the burn is the abundance of prostrate kochia in 2003. This species was seeded following the fire and doing very well on the site at an estimated 4,020 plants/acre in 2003. Nearly one-half (46%) of the population consists of young plants so the population will

likely increase in the future if there are open sites to become established on. Kochia displayed normal vigor in 2003 and use was mostly moderate. Broom snakeweed was abundant before and after the burn on this site. Density was estimated at 3,160 plants/acre in 1998, and 2,740 plants/acre in 2003. This species does well with disturbance and has persisted on the site following the burn.

The herbaceous understory on the immediate transect shows little change before and after the burn. As discussed above, most of the area immediately surrounding and including the transect was not chained so few seeded perennials became established on the site in 2003. Perennial grasses include Sandberg bluegrass, bluebunch wheatgrass, bottlebrush squirreltail, and bulbous bluegrass. Bulbous bluegrass is a low value perennial and was the only species that showed a significant increase in 2003. Perennial grasses were noted as being heavily utilized by cattle in the past. Cheatgrass decreased in nested frequency between 1998 and 2003, but remained the most abundant species in both frequency and average cover in 2003. The forb component has been sparse in all years. Storksbill, an annual, was the most abundant forb in 2003. Several seeded forbs were sampled on the site but in low numbers. These included alfalfa, Lewis flax, northern sweetvetch, and small burnet. However, these species were noted as being more abundant in the surrounding areas that were chained.

1985 APPARENT TREND ASSESSMENT

In spite of poor vegetative cover, the soil appears to have minimal erosion and is basically stable. Because of the low density of plants and because few were sampled, it is difficult to assess trend for browse from the data. However, the site appears stable at present but is leaning toward a downward trend unless reproduction of the browse species improves. Browsing pressure from big game is moderate and sustainable, but a deferment or rest from cattle grazing would be very beneficial to the site. It is good winter range, with adequate browse and cover, but it has a definite lack of herbaceous vegetation for spring green-up and erosion control.

1991 TREND ASSESSMENT

Basic cover features have shown positive improvements since 1985. Basal vegetative cover has gone from a low of 1% up to 5%. Rock-pavement cover has remained about the same at 10% with litter cover increasing to 75%. Percent bare ground is half what it was in 1985 (22% to 11%). Trend for soil is up. Key browse species in order of abundance are: mountain big sagebrush, antelope bitterbrush, and cliffrose. Mountain big sagebrush has actually increased in density with a decrease in number of decadent plants, while both cliffrose and bitterbrush demonstrated lower densities and increased rates of decadency. Trend for browse is slightly downward even with the increases for sagebrush. The herbaceous understory is mostly made up of grass species. Bluebunch wheatgrass has gone from 10% to 24% quadrat frequency. Sandberg bluegrass and bottlebrush squirreltail also demonstrated increases in their quadrat frequencies. There are few perennial forb species and all occur infrequently. Trend for the herbaceous understory is slightly improving.

TREND ASSESSMENT
soil - up (5)
browse - slightly downward (2)
herbaceous understory - slightly improving (4)

1998 TREND ASSESSMENT

Trend for soil is stable. Percent bare ground has remained similar to 1991 estimates. Litter cover shows a significant decline, but this appears to be due to dried up cheatgrass being classified as litter instead of vegetation in 1991. Erosion is not a serious problem on the site. Overall, trend for browse is slightly up.

Mountain big sagebrush is receiving heavier use, but vigor is normal on most plants and percent decadence declined from 30% in 1991 to 14% in 1998. Dead plants, first sampled in 1998, are numerous at 600 plants/acre and it appears that the reduction in decadence is due to a die-off of decadent plants since 1985. Recruitment is currently good with enough young plants to replace decadent/dying plants. Bitterbrush are more heavily utilized in 1998, yet vigor has improved and percent decadence has declined from 50% to 0%. Cliffrose appears to have a relatively steady population with mostly moderate use and good vigor. Percent decadence has also declined from 50% in 1991 to 0% in 1998. Recruitment is currently adequate. Trend for the herbaceous understory is up slightly due to an increase in the sum of nested frequency for perennial grasses. All perennial grasses found on the site increased in nested frequency since 1991. Cheatgrass is still abundant however, making up 51% of the grass cover. Forbs are still limited and consist mostly of annuals.

TREND ASSESSMENT
soil - stable (3)
browse - up slightly (4)
herbaceous understory - slightly improving (4)

2003 TREND ASSESSMENT

Trend for soil is slightly down. Due to fire and drier conditions compared to 1998, litter cover drastically declined and percent bare soil increased. Although erosion was not severe in 2003, there were signs of litter and soil movement on the surface. Herbaceous vegetation cover remains high, although annual species provide a high proportion of it. Trend for browse is stable. Mountain big sagebrush remains the most abundant key browse following the burn. Although density declined from 2,040 plants/acre in 1998 to 1,440 plants/acre in 2003, the big sagebrush population is healthy and vigorous with low decadence and over half of the population consisting of young plants. Bitterbrush and cliffrose both declined in density in 2003 and neither population has any reproduction. Use on both species remains moderate to heavy, although vigor was normal. The current low densities of bitterbrush and cliffrose will likely result in these species being singled out by animals. Prostrate kochia, a species that was seeded throughout the area as part of fire rehabilitation efforts, has an estimated density of about 4,000 plants/acre in 2003. This species will likely increase in the future as young plants make up 46% of the population. It will spread into areas where cheatgrass is dominant. Kochia is a good forage source for wildlife as evidenced by the moderate use on this species in 2003. Trend for the herbaceous understory is stable, but composition is poor. Cheatgrass remains the dominant grass although it significantly declined in nested frequency. Storksbill, an annual, is the most abundant forb. Although the surrounding area was seeded and chained following the Swain fire, the transect itself was not chained so the presence of some seeded species is lower on the transect compared to surrounding areas. Northern sweetvetch, small burnet, and alfalfa were noted as being abundant in patches, although they were rarely sampled in the transect. Perennial grasses slightly declined in sum of nested frequency overall, but perennial forbs showed a slight increase.

TREND ASSESSMENT
soil - slightly down (2)
browse - stable (3)
herbaceous understory - stable (3)

HERBACEOUS TRENDS --
Management unit 21 , Study no: 8

Type	Species	Nested Frequency				Average Cover %	
		'85	'91	'98	'03	'98	'03
G	Agropyron intermedium	-	-	-	6	-	.24
G	Agropyron spicatum	$_{a}$21	$_{ab}$61	$_{b}$97	$_{ab}$56	4.71	3.84
G	Bromus japonicus (a)	-	-	-	3	-	.60
G	Bromus tectorum (a)	-	-	$_{b}$304	$_{a}$262	9.32	11.38
G	Festuca ovina	-	-	-	2	-	.03
G	Poa bulbosa	$_{a}$-	$_{a}$1	$_{a}$14	$_{b}$50	.48	2.43
G	Poa secunda	$_{a}$72	$_{b}$119	$_{b}$138	$_{ab}$105	2.62	1.77
G	Sitanion hystrix	$_{a}$13	$_{a}$23	$_{b}$57	$_{b}$59	1.20	1.81
Total for Annual Grasses		0	0	304	265	9.32	11.98
Total for Perennial Grasses		106	204	306	278	9.02	10.14
Total for Grasses		106	204	610	543	18.35	22.13
F	Achillea millefolium	-	-	-	3	-	.06
F	Agoseris glauca	$_{a}$-	$_{b}$16	$_{a}$-	$_{ab}$6	-	.04
F	Alyssum alyssoides (a)	-	-	$_{b}$60	$_{a}$1	.28	.00
F	Arabis spp.	-	9	7	-	.09	-
F	Astragalus spp.	-	-	3	-	.00	-
F	Calochortus nuttallii	-	4	2	1	.00	.00
F	Chaenactis douglasii	24	-	-	-	-	-
F	Cirsium spp.	-	-	-	-	-	.00
F	Erodium cicutarium (a)	-	-	$_{a}$4	$_{b}$163	.06	9.48
F	Hedysarum boreale	-	-	-	2	-	.03
F	Helianthus annuus (a)	-	-	-	1	-	.03
F	Lactuca serriola	-	9	-	3	-	.00
F	Linum lewisii	-	-	8	3	.04	.01
F	Lomatium spp.	$_{a}$-	$_{b}$13	$_{a}$-	$_{b}$14	-	.10
F	Medicago sativa	$_{a}$-	$_{a}$-	$_{a}$-	$_{b}$15	-	1.37
F	Microsteris gracilis (a)	-	-	-	1	-	.00
F	Ranunculus testiculatus (a)	-	-	12	-	.04	-
F	Sanguisorba minor	-	-	-	3	-	.09
F	Tragopogon dubius	-	-	3	-	.00	-
F	Zigadenus paniculatus	4	2	-	-	-	.00
Total for Annual Forbs		0	0	76	166	0.39	9.52
Total for Perennial Forbs		28	53	23	50	0.14	1.74
Total for Forbs		28	53	99	216	0.54	11.26

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 21 , Study no: 8

Type	Species	Strip Frequency		Average Cover %	
		'98	'03	'98	'03
B	Artemisia tridentata vaseyana	55	38	6.17	1.01
B	Chrysothamnus nauseosus hololeucus	0	3	-	-
B	Cowania mexicana stansburiana	8	3	5.19	1.16
B	Gutierrezia sarothrae	41	41	1.73	1.54
B	Juniperus osteosperma	5	4	5.94	5.33
B	Kochia prostrata	0	45	-	2.04
B	Opuntia spp.	1	3	-	.03
B	Purshia tridentata	18	2	8.60	1.29
B	Quercus gambelii	0	1	.53	-
B	Rhus glabra cismontana	3	0	-	-
B	Ribes spp.	1	0	-	-
Total for Browse		132	140	28.19	12.42

CANOPY COVER, LINE INTERCEPT --
Management unit 21 , Study no: 8

Species	Percent Cover	
	'98	'03
Artemisia tridentata vaseyana	-	.83
Cowania mexicana stansburiana	.80	1.41
Gutierrezia sarothrae	-	3.21
Juniperus osteosperma	15.00	8.50
Kochia prostrata	-	1.83
Opuntia spp.	-	.01
Purshia tridentata	-	1.13
Quercus gambelii	-	.05

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 21 , Study no: 8

Species	Average leader growth (in) '03
Cowania mexicana stansburiana	2.6

POINT-QUARTER TREE DATA --
Management unit 21 , Study no: 8

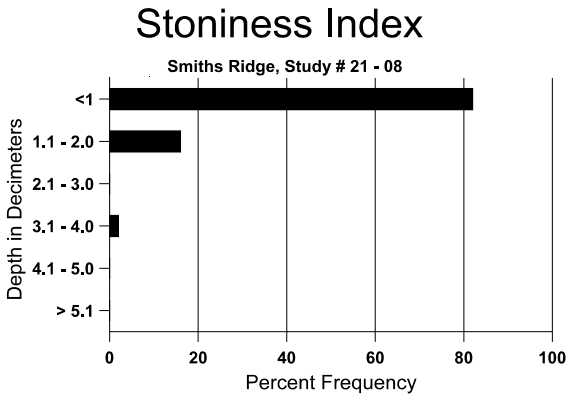
Species	Trees per Acre '98	Trees per Acre '03	Average diameter (in) '98	Average diameter (in) '03
Juniperus osteosperma	46	26	6.9	12.3

BASIC COVER --
Management unit 21 , Study no: 8

Cover Type	Average Cover % '85	'91	'98	'03
Vegetation	1.00	4.75	45.84	47.30
Rock	5.25	6.75	5.48	9.83
Pavement	5.25	3.00	7.62	6.87
Litter	66.75	74.50	52.99	35.81
Cryptogams	.25	0	4.07	.09
Bare Ground	21.50	11.00	11.92	17.36

SOIL ANALYSIS DATA --
Management unit 21, Study no: 8, Study Name: Smiths Ridge

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	ds/m
8.9	66.2 (6.3)	5.7	62.0	19.4	18.6	3.5	12.0	76.8	0.4



PELLET GROUP DATA --
Management unit 21 , Study no: 8

Type	Quadrat Frequency	
	'98	'03
Rabbit	8	10
Elk	11	3
Deer	15	41
Cattle	-	3

Days use per acre (ha)	
'98	'03
-	-
28 (69)	12 (30)
70 (173)	90 (222)
-	2 (4)

BROWSE CHARACTERISTICS --
Management unit 21 , Study no: 8

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Artemisia tridentata vaseyana											
85	**1333**	-	133	400	800	-	25	0	60	10	28/25
91	**1532**	266	600	466	466	-	13	4	30	13	16/17
98	**2040**	-	280	1480	280	600	48	.98	14	12	20/27
03	**1440**	40	880	440	120	60	31	8	8	3	14/18
Chrysothamnus nauseosus hololeucus											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**80**	-	-	80	-	-	0	0	-	0	12/13
Cowania mexicana stansburiana											
85	**332**	-	-	266	66	-	80	0	20	0	68/81
91	**266**	133	-	133	133	-	75	0	50	0	142/53
98	**220**	-	40	180	-	20	64	0	0	0	56/106
03	**60**	-	-	40	20	-	67	33	33	0	57/94
Gutierrezia sarothrae											
85	**2466**	-	66	2000	400	-	0	0	16	30	13/12
91	**2666**	133	400	2266	-	-	0	0	0	0	12/11
98	**3160**	-	620	2540	-	-	0	0	0	0	10/13
03	**2740**	-	60	2520	160	-	3	0	6	5	10/12
Juniperus osteosperma											
85	**133**	-	-	133	-	-	0	0	-	0	69/109
91	**133**	-	-	133	-	-	0	0	-	0	144/111
98	**100**	20	-	100	-	20	0	0	-	0	-/-
03	**80**	-	-	80	-	-	0	0	-	0	-/-

		Age class distribution (plants per acre)					Utilization				
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% poor vigor	Average Height Crown (in)
Kochia prostrata											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	-/-
03	**4020**	100	1860	2160	-	-	57	2	-	0	9/14
Opuntia spp.											
85	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**20**	-	-	-	20	-	0	0	100	100	8/17
03	**80**	-	40	40	-	-	0	0	0	0	6/9
Purshia tridentata											
85	**532**	-	133	333	66	-	75	0	12	0	25/23
91	**266**	-	-	133	133	-	75	0	50	25	30/51
98	**600**	-	20	580	-	20	67	20	0	0	42/90
03	**60**	-	-	60	-	-	67	33	0	0	46/88
Quercus gambelii											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**0**	-	-	-	-	-	0	0	-	0	83/69
03	**20**	-	-	20	-	-	0	0	-	0	16/12
Rhus glabra cismontana											
85	**0**	-	-	-	-	-	0	0	0	0	-/-
91	**0**	-	-	-	-	-	0	0	0	0	-/-
98	**60**	-	-	-	60	-	100	0	100	67	-/-
03	**0**	-	-	-	-	-	0	0	0	0	-/-
Ribes spp.											
85	**0**	-	-	-	-	-	0	0	-	0	-/-
91	**0**	-	-	-	-	-	0	0	-	0	-/-
98	**200**	-	-	200	-	-	0	0	-	0	11/14
03	**0**	-	-	-	-	-	0	0	-	0	-/-